

Replacement Sheet  
Title: **LOW-FIRING TEMPERATURE METHOD FOR  
PRODUCING AL<sub>2</sub>O<sub>3</sub> BODIES HAVING ENHANCED  
CHEMICAL RESISTANCE**  
Applicant: Gerard E. Parker  
Application No. 10/092,080

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**Fig. 3A**

**Long-Term Corrosion Study of Typical Low-Temperature High-Alumina (LTHA):**

<u>MATERIAL</u>	<u>WEIGHT LOSS</u>
ZTA	-70 percent
SiC/SiC	-30 percent
LTHA Sample	-30 percent

**Materials Corrosion Test:**  
Independent Test

**Weight loss in mg/dm<sup>2</sup>/day**

46.7% Hydrofluoric (HF) acid @ 25°C

	<u>5 day immersion</u>	<u>35 day immersion</u> (30 after 5)
SiC-Silica free	1.00	1.00
ZrO <sub>2</sub> - Toughened	1110.00	1070.00 <sup>(1)</sup>
Al <sub>2</sub> O <sub>3</sub> - 99.9%	1.92	2.26
<b>LTHA Sample</b> (Membrane-approx. 36% porosity)	1.0	0.16 <sup>(2)</sup>
<b>LTHA Sample</b> (Solid)	1.64	0.09

**NOTE:** Weight loss is listed in mg/dm<sup>2</sup>/day rounded to nearest 0.01g.

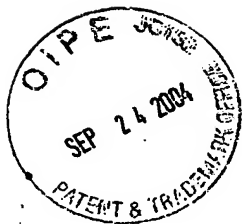
- (1): Approximately 2/3 of the coupon was destroyed in 35 days of testing.  
(2): This is a rather severe test in that the surface area is approx. 36% greater than the normal as tested.

**Materials Corrosion Test:**

50% H<sub>3</sub>PO<sub>4</sub> @ 25°C

	<u>Cum. Mg/dm<sup>2</sup> (approx.)</u>	
	24 Hours	120 Hours
AD90	5.35	9.65
AD94	2.72	5.00
AD96	4.82	12.54
ADO96	5.61	11.59
AD99.5	6.75	10.26
TTZ	0.88	3.33
<b>LTHA Sample</b>	1.66	2.02





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3A

3A

30% NaOH @ 25°C

	<u>Cum. Mg/dm<sup>2</sup> (approx.)</u>	
	24 Hours	120 Hours
AD90	24.98	51.15
AD94	15.24	32.27
AD96	2.13	6.10
AD096	11.59	14.61
AD99.5	8.23	12.20
TTZ	0.61	0.61
<b>LTHA Sample</b>	1.72	2.01

**NOTE:** Weight loss is mg/dm<sup>2</sup>/day, rounded to nearest 0.01g.

**Materials Corrosion Test:**

Weight loss in mg/cm<sup>2</sup>/day

	60% H <sub>3</sub> PO <sub>4</sub> @ 60°C	30% NaOH @ 60°C
A479 Al <sub>2</sub> O <sub>3</sub> (90%)	0.15	0.28
A479SS Al <sub>2</sub> O <sub>3</sub> (99.5%)	0.07	0.12
3NaI <sub>2</sub> O <sub>3</sub> (99.9%)	0.02	0.00
<b>LTHA Sample</b>	0.00	0.00

**NOTE:** Weight loss is mg/cm<sup>2</sup>/day, rounded to nearest 0.01 g.

**High Alumina Corrosion Test:**

Independent Test

<u>CORROSIVE SOLUTION</u>	<u>HCl</u>	<u>HNO<sub>3</sub></u>	<u>H<sub>2</sub>SO<sub>4</sub></u>
<u>MATERIAL</u>	<u>% WEIGHT LOSS</u>		
Product of Manufacturer A:			
85% Al <sub>2</sub> O <sub>3</sub>	0.066	0.076	0.066
96% Al <sub>2</sub> O <sub>3</sub>	0.081	0.087	0.200
<b>LTHA Sample</b>	(No Detectable Loss)		
Product of Manufacturer B:			
99.5% Al <sub>2</sub> O <sub>3</sub>	0.217	0.163	0.216

**PROCEDURES**

1. Check the initial weight (approximately 5 grams)
2. Immerse into high concentration acid/base solutions
3. Dilute with 50 volume % of distilled water
4. Boil for an hour, and let soak overnight
5. Check the final weight
6. Calculate percent weight loss

$$\% \text{ LOSS} = (\text{INITIAL WEIGHT} - \text{FINAL WEIGHT}) / \text{INITIAL WEIGHT}$$

**Fig. 3B**